SWRHL-15r

FINAL REPORT OF OFF-SITE SURVEILLANCE FOR THE KIWI B4E EXPERIMENT

by the
Southwestern Radiological Health Laboratory
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ABSTRACT

The Public Health Service provided off-site surveillance for the KIWI B4E full power reactor run conducted on August 28, 1964, and for a restart of the reactor on September 10, 1964. Small amounts of radioactive material were detected off site following both tests; however, in no instance did exposures exceed the radiological safety guides set forth in the AEC Manual, Chapter 0524.

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INTRODUCTION

On August 28 and September 10, 1964 the KIWI B4E reactor was tested at Test Cell C, located at the Nuclear Rocket Development Station, Jackass Flats, Nevada. Each test was conducted at design power and the reactor was operated in an upright position so that the hydrogen coolant exhausted upward along with escaping fission products. Each test will be covered in a separate section of this report.

Under a Memorandum of Understanding with the Atomic Energy Commission (AEC), the U. S. Public Health Service (PHS) conducts a program of radiological monitoring and environmental sampling in the off-site area surrounding the Nevada Test Site and the Nellis Air Force Range. The overall complex of the Nevada Test Site(NTS) and the Nellis Air Force Range (NAFR) includes the Nuclear Rocket Development Station (NRDS) and the Tonopah Test Range (TTR) and for simplicity will be called the test range complex throughout this report.

Since Public Health Service monitors must begin tracking and monitoring an effluent cloud close to its point of origin, measurements are also made within the test range complex, but are used only as a guide to trajectory determination or for purposes of checking instrumentation and methodology. They did not serve as parameters in determining dose to people or contamination of property in the off-site area during the KIWI B4E tests and are not a subject of this report.

Section 1. KIWI B4E EPV, AUGUST 28, 1964

I. OPERATIONAL PROCEDURES

On August 28, the KIWI B4E reactor was tested under the conditions known as Experimental Plan V (EPV). The reactor was operated at design power from 1239 to 1247 hours PDT.

A. External Measurements

Ground Monitoring

Thirteen ground monitors tracked the reactor effluent passage with portable instruments. Each monitor was equipped with an Eberline E-500B, a Precision Model 111 Standard "Scintillator", and a Victoreen Radector Model No. AGB-50B-SR.

The Eberline E-500B has a range of 0 to 200 milliroentgens per hour (mr/hr) gamma and beta-gamma detection in four scales with an external halogen filled GM tube and a 0 to 2000 mr/hr range from an internal Anton 302 tube. The Precision Model 111 "Scintillator" is used primarily for low level detection and provides for a range of 0 to 5 mr/hr in six scales. The Radector has a range of 0 to 50,000 mr/hr on two scales. This instrument employs an air ionization chamber. These instruments are accurate to $\pm$ 20%, and readings can be taken to two significant figures.

Remote Dose Rate Recorders

Eberline RM-11 dose rate recorders were placed at sixteen stations around the test range complex. These recorders utilize a Geiger tube detector to document radiation levels at specific locations. The instrument has a 0.01 to 100 mr/hr range and the gamma dose rate is recorded on a 30-hour strip chart. The RM-11 is accurate to $\pm$ 20% as calibrated with a Co^{60} source. The locations of dose rate recorders are presented in Figure 1.

Aerial Cloud Tracking

An Air Force U-3A aircraft, manned by two Public Health Service monitors equipped with portable instruments identical to those of the ground monitors, tracked the reactor effluent to position ground monitors. Two Public Health Service C-45 aircraft containing sampling equipment were also used as aids in cloud tracking. However, their primary purpose was cloud sampling in order to determine cloud size and inventory. The results of their sampling are reported separately.

Film Badges

The PHS maintains 65 film badge stations off the test range complex and assigns badges to 166 off-site residents. The badge used is made up of Dupont Type 555 film. This film is accurate to ± 50% in the 20 to 100 mr range and ± 10% in the 100 to 2000 mr range.

B. Environmental Measurements

Air Samples

On the test day the PHS maintained General Metal Works high volume air samplers containing glass fiber prefilters at 33 off-site locations as shown in Figure 1. Thirteen of the air samplers were equipped with MSA* charcoal cartridges in addition to the prefilters. All air sample prefilters collected following the KIWI reactor runs were returned to the Southwestern Radiological Health Laboratory (SWRHL) in Las Vegas to be counted for gross beta activity with a thin window, large area proportional probe connected to a high speed scaler. The system has an efficiency of approximately 30% for 1.5 Mev betas and has a background of 575 ± 20 counts per minute.

Gross beta concentrations were computed at the time of count for the purpose of screening samples and delineating the effluent trajectory. These samples were then stored for five days to allow

*Mine Safety Appliance Company

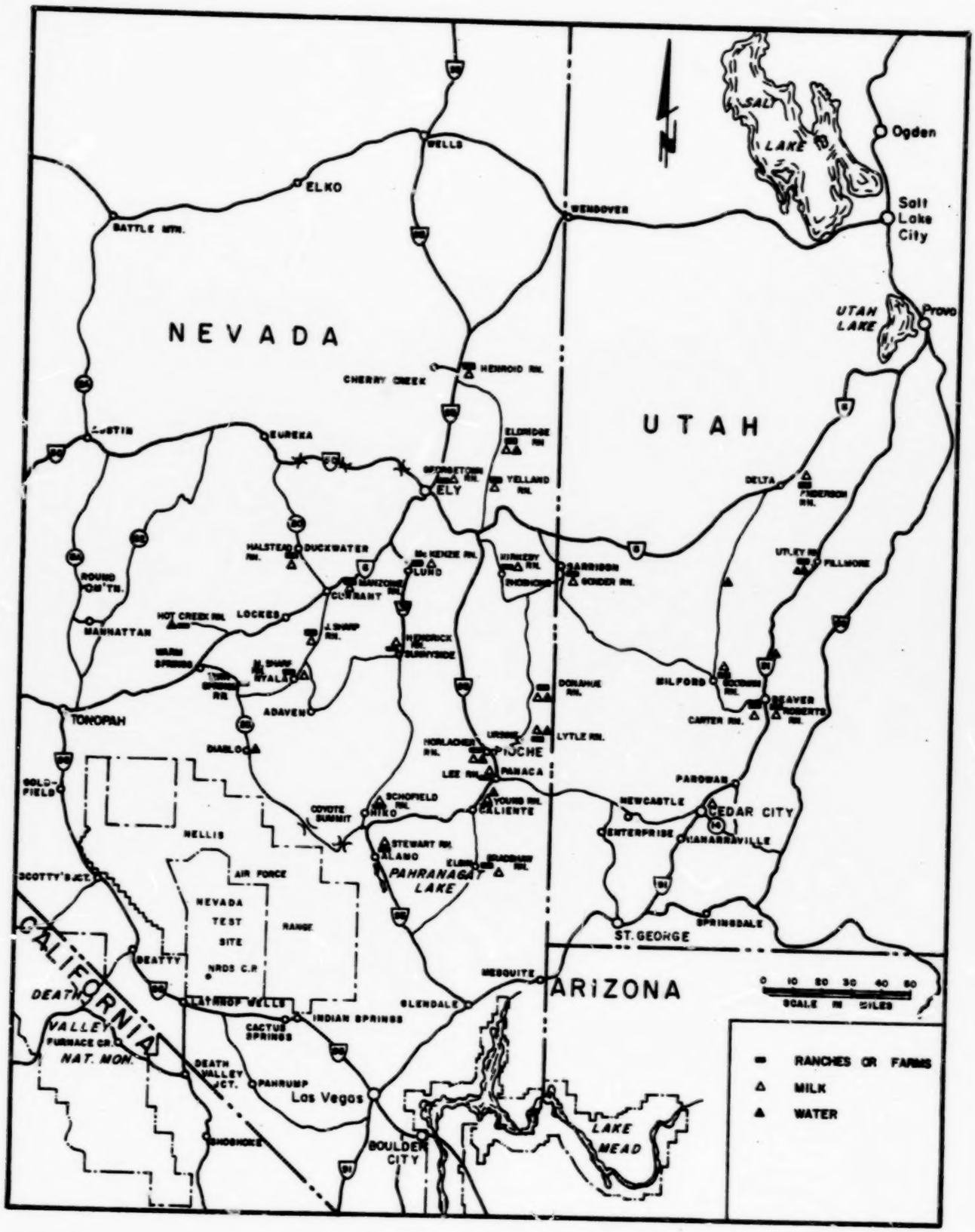

Figure 1. Air sampler and dose rate recorder locations.

natural activity to decay. They were recounted at this time and again seven days later. Activity levels were then recomputed to end of collection from these two later counts.

Several air samples exhibiting levels of activity significantly above natural background were recounted frequently to obtain a decay curve. The curve obtained was then analyzed for best fit to the general equation $y=ax^b$. Based on an analysis of decay curves, a $T^{-1.25}$ relationship was found to exist with a mean error of $\pm 5\%$. This relationship was then used to extrapolate the activity to the end of the collection period.

All charcoal cartridges were analyzed for gamma isotopes by placing each cartridge directly on a 4" x 4" sodium iodide crystal coupled to a 400-channel pulse height analyzer set to view energies from 0 to 2 Mev. Assuming no break in the prefilter, the activity on the cartridge should represent the gaseous fission products such as isotopes of iodine. Overall detection efficiency for this geometry is about 18% at 0.53 Mev (I^{133}). The minimum detectable activity for I^{131}, I^{132}, I^{133}, and I^{135} is taken to be 200 picocuries with an associated error of $\pm$ 50% for I^{131}, I^{132}, I^{133}, and $\pm$ 100% for I^{135}. The time of count is 10 minutes. Error estimates are such that values less than 1 picocurie per cubic meter (pc/M^3) are generally not reported. Since it is not possible to define duration of effluent passage at all locations, the reported values given as pc/M^3 assume an average concentration over each entire sampling period.

Milk and Water Samples

After each release of activity from NRDS, milk samples are collected from dairies (processing plants), producing dairy farms, and farms producing milk for their own consumption. Milk samples were collected, relative to this event, from the locations shown in Figure 2. Each sample is counted for 50 minutes. No attempt is

Figure 2. Environmental sampling locations.

made to recount samples giving low positive values. The lower limit of detection for gamma emitters in milk samples is taken to be 20 picocuries per liter (pc/l) at the time of count, and all results below that value are reported as <20 pc/l. The error associated with reported values is ± 20 pc/l. All reported values are extrapolated to collection time. When it became evident that no contamination of milk was occurring, the sampling program ceased on September 2, 1964.

All liquid samples are counted in 3.5 liter inverted well aluminum beakers which are placed on top of a 4" x 4" crystal coupled to a 400-channel gamma pulse height analyzer. Overall detection efficiency for the 0.364 Mev photopeak of I^{131} is 6.4%. A matrix technique is employed in computation to compensate for the interference due to the presence of other isotopes. The input to this matrix is variable, allowing for the simultaneous determination of any eight nuclides for which detection efficiencies and interference factors have been obtained. Actual computation is performed by an IBM 1620 computer.

Vegetation samples were obtained at most milk sampling locations An attempt was made to make the samples representative of the cow's feed; however, the samples were taken primarily as early indicators of where milk might become contaminated and were not intended to yield a cow intake-excretion formula. For this reason the vegetation sample results are reported simply as fresh fission products present or not present.

II. RESULTS

The August 28 design power run yielded low levels of radioactivity off the test range complex. A summary of weather conditions at 1155 on the test day is presented in Table 2. Based on these conditions radiation monitors were positioned in an area north by northeast of the test range complex.

A. Ground Monitoring Data

Peak gamma dose rates occurring off the test range complex are given in Table 1. The only locations at which ground monitors detected dose rates above background were Coyote Summit and Goss' Ranch; Coyote Summit is uninhabited and Goss' Ranch had a population of two adults and three children during the surveillance period.

Table 1. Dose rate measurements off the test range complex on August 28, 1964.

Location (See Fig. 1)	Time of Peak Dose Rate (PDT)	Time interval in which dose rates greater than background existed.	Net Peak dose rate (mr/hr)
Goss' Ranch	1505	1440-1545	0.18
Coyote Summit	1505	1445-1550	0.17

B. Dose Rate Recorder Data

Recorder data indicated no dose rates above background on the test day. This includes data from Diablo, Twin Springs Ranch, Lund, Pioche, and Caliente.

C. Film Badge Data

Due to the low dose rates encountered at points north of the test range complex, no off-site film badges were collected imme-

diately following the KIWI B4E test. Badges collected since that time, however, have had no exposures which could be attributed to the EPV test.

Table 2. Meteorological data for EPV.

Upper air data at: Jackass Flats, Nevada, 1155 PDT, 8/28/64

Height (Ft. MSL)	Wind (Deg/kts)	Pressure (mb)	Temperature (°C)	Dew Point (°C)	Relative Humidity (%)
SFC	200/10	885	29.3	- 2.0	13
4000	200/21	874	26.1	- 2.6	15
5000	200/18	843	21.2	- 4.2	18
6000	203/16	814	18.6	- 4.3	21
7000	199/16	787	16.2	- 5.0	23
8000	191/16	750	13.5	- 5.2	27
9000	200/18	730	11.5	-11.4	19
10000	210/23	705	11.4	-12.1	18
11000	236/17	678	9.4	-12.4	20
12000	248/17	653	7.3	-13.0	22
13000	243/21	630	4.8	-14.5	23
14000	258/16	607	2.2	-16.3	24

D. Air Sample Data

Several samples obtained on the test day contained fresh fission products. The results of analyses of the prefilters and charcoal cartridges are presented in Table 3.

Table 3. Analyses of air samples containing fresh fission products collected following the KIWI B4E EPV Experiment reported in pc/M^3 at end of collection.

Location	Time-Date on Hrs PDT	Time-Date off Hrs PDT	Volume (M^3)	Prefilter Gross Beta		Gamma Pulse Ht. Analysis I^{131}	I^{132}	I^{133}	I^{135}
Goss' Ranch	1400 8-28	1600 8-28	85	22.0	P	3	10	42	<1
					C	10	1000	100	500
Pioche	1840 8-28	1200 8-29	707	<1	P	ND	ND	<1	ND
					C	ND	ND	<1	ND
Hiko	1445 8-28	0900 8-29	776	<1	P	ND	ND	<1	ND
					C	ND	ND	<1	ND

P-prefilter C-charcoal cartridge ND-not detectable

In addition to the above information, a charcoal cartridge from an air sampler at Blue Jay Maintenance Station showed the following results: I^{131}, <1; I^{132}, ND; I^{133}, ND; I^{135}, ND. This sample ran from 0700 hours on August 28 to 0700 hours on August 29.

Air samples taken on August 28 at Alamo, Sunnyside, Currant, Lund, and Ely, Nevada, and Garrison, Utah, did not possess fresh fission products when analyzed.

E. Milk Sample Data

A milk sample obtained on August 30 from Donahue's Ranch, located 25 miles north of Ursine, Nevada, indicated the presence of I^{131} at a level of 20 pc/l - the threshold of detectability for this isotope. Milk samples obtained from 21 other ranches and four producer dairies did not contain fresh fission products in detectable quantities. The cesium values reported are within the range of the cesium levels generally found in the particular areas sampled.

F. Water Sample Data

A non-potable water sample taken from a pond at Fillmore, Utah on August 31 indicated 20 pc/l of I^{131}. Six additional samples from other locations in Nevada and Utah did not contain fresh fission products when analyzed.

Table 4. Milk and vegetation sample analyses for EPV

COLLECTION DATA		Milk Radioassay Data			
LOCATION	DATE COLLECTED 1964	ACTIVITY (pc/l) I^{131}	I^{133}	Cs^{137}	Vegetation Samples Taken
M. Sharp Ranch	8/29 AM	<20	<20	25	P
Nyala, Nevada	8/30 AM	<20	<20	100	---
	8/31 AM	<20	<20	70	---
	9/01 AM	<20	<20	70	---
Blue Eagle Ranch (J.Sharp)	8/29 AM	<20	<20	65	P
Currant, Nevada	8/29 AM	<20	<20	70	ND
	8/31 AM	<20	<20	80	---
	9/01 AM	<20	<20	100	---
	9/02 AM	<20	<20	90	---
Manzonie Ranch	9/01 AM	<20	<20	50	---
Currant, Nevada	9/02 AM	<20	<20	60	---
Halstead Ranch	9/02 AM	<20	<20	65	ND
Duckwater, Nevada					
Hendrick Ranch	8/30 AM	<20	<20	90	---
Sunnyside, Nevada	8/31 AM	<20	<20	95	---
	9/02 AM	<20	<20	75	---
McKenzie Dairy	8/29 AM	<20	<20	95	ND
Lund, Nevada	8/30 AM	<20	<20	85	ND
	8/31 AM	<20	<20	80	---

ND - fresh fission products not present in vegetation.
P - presence of fresh fission products in vegetation samples.
--- vegetation samples not taken.

Table 4. Milk and vegetation sample analyses for EPV (cont)

COLLECTION DATA		Milk Radioassay Data			
LOCATION	DATE COLLECTED	ACTIVITY (pc/l) I^{131}	ACTIVITY (pc/l) I^{133}	ACTIVITY (pc/l) Cs^{137}	Vegetation Samples Taken
	1964				
McKenzie Dairy (cont)	9/01 AM	<20	<20	100	ND
Georgetown Ranch Ely, Nevada	8/30 AM	<20	<20	45	ND
	8/31 AM	<20	<20	45	---
	9/02 AM	<20	<20	50	---
Henroid Ranch Cherry Creek, Nevada	9/02 AM	<20	<20	90	ND
Yelland Ranch Ely, Nevada	8/29 AM	<20	<20	115	P
	8/30 AM	<20	<20	85	ND
	8/31 AM	<20	<20	110	---
	9/01 PM	<20	<20	130	ND
Eldridge Ranch Ely, Nevada	9/02 AM	<20	<20	150	ND
Kirkeby Ranch Shoshone, Nevada	8/29 AM	<20	<20	70	ND
	8/30 AM	<20	<20	25	ND
	8/31 AM	<20	<20	20	---
	9/01 AM	<20	<20	30	---
	9/02 AM	<20	<20	10	---

ND - fresh fission products not present in vegetation.
P - presence of fresh fission products in vegetation samples.
--- vegetation samples not taken.

Table 4. Milk and vegetation sample analyses for EPV (cont)

COLLECTION DATA		Milk Radioassay Data			
		ACTIVITY (pc/l)			
LOCATION	DATE COLLECTED	I^{131}	I^{133}	Cs^{137}	Vegetation Samples Taken
	1964				
Donahue Ranch Ursine, Nevada	8/30 AM	20	<20	40	P
	8/31 AM	<20	<20	40	---
	9/01 AM	<20	<20	60	---
	9/02 AM	<20	<20	55	---
Lytle Ranch Ursine, Nevada	8/29 AM	<20	<20	25	ND
	8/30 AM	<20	<20	20	ND
	9/01 AM	<20	<20	60	---
Horlacher Ranch Pioche, Nevada	8/29 AM	<20	<20	55	ND
	8/30 AM	<20	<20	60	ND
	8/31 AM	<20	<20	65	---
	9/01 AM	<20	<20	80	---
Lee Ranch Panaca, Nevada	9/01 AM	<20	<20	60	---
	9/02 AM	<20	<20	65	---
Young Ranch Caliente, Nevada	8/29 PM	<20	<20	30	P
	8/30 AM	<20	<20	20	ND
	8/31 AM	<20	<20	20	---
	9/01 AM	<20	<20	20	---
	9/02 AM	<20	<20	30	---

ND - fresh fission products not present in vegetation.
P - presence of fresh fission products in vegetation samples.
--- vegetation samples not taken.

Table 4. Milk and vegetation sample analyses for EPV (cont)

COLLECTION DATA		Milk Radioassay Data			
		ACTIVITY (pc/l)			
LOCATION	DATE COLLECTED	I^{131}	I^{133}	Cs^{137}	Vegetation Samples Taken
	1964				
Bradshaw Ranch Elgin, Nevada	9/01 PM	<20	<20	60	ND
Schofield Dairy Hiko, Nevada	8/29 AM	<20	<20	45	P
	8/30 AM	<20	<20	40	ND
	8/31 AM	<20	<20	40	---
	9/01 AM	<20	<20	40	---
	9/02 AM	<20	<20	40	---
Stewart Dairy Alamo, Nevada	8/29 AM	<20	<20	40	ND
	8/30 AM	<20	<20	40	ND
	8/31 AM	<20	<20	40	---
	9/01 AM	<20	<20	65	---
	9/02 AM	<20	<20	50	---
College of S. Utah Cedar City, Utah	8/31 PM	<20	<20	65	---
Roberts Ranch Beaver, Utah	8/31 PM	<20	<20	60	---
	9/01 AM	<20	<20	55	ND
	9/02 AM	<20	<20	35	---

ND - fresh fission products not present in vegetation.
P - presence of fresh fission products in vegetation samples.
--- vegetation samples not taken.

Table 4. Milk and vegetation samples analyses for EPV (cont)

COLLECTION DATA		Milk Radioassay Data			Vegetation Samples Taken
LOCATION	DATE COLLECTED	ACTIVITY (pc/l) I^{131}	ACTIVITY (pc/l) I^{133}	ACTIVITY (pc/l) Cs^{137}	
	1964				
Carter Ranch Beaver, Utah	8/31 PM	<20	<20	45	---
Goodwin Ranch Milford, Utah	8/30 AM	<20	<20	<20	ND
	8/31 AM	<20	<20	25	---
	9/01 PM	<20	<20	25	ND
	9/02 AM	<20	<20	30	---
Utley Ranch Fillmore, Utah	8/29 AM	<20	<20	25	ND
	8/30 AM	<20	<20	40	ND
	8/31 AM	<20	<20	65	---
Anderson Ranch Delta, Utah	8/29 AM	<20	<20	95	ND
	8/30 AM	<20	<20	110	ND
	8/31 AM	<20	<20	115	---
	9/02 AM	<20	<20	50	---
Gonder Ranch Garrison, Utah	8/29 AM	<20	<20	40	ND
	8/30 AM	<20	<20	55	ND
	8/31 AM	<20	<20	45	---
	9/01 AM	<20	<20	55	---
	9/02 AM	<20	<20	45	---

ND - fresh fission products not present in vegetation.
P - presence of fresh fission products in vegetation samples.
--- vegetation samples not taken.

III. CONCLUSIONS

The KIWI B4E-EPV test yielded low levels of radioactivity off the test range complex. Fresh fission products were found in a sector north by northeast of the complex. Vegetation samples bearing fresh fission products were found as far north as the Blue Jay Maintenance Station and Spring Valley (30 miles NE of Ely, Nevada), and as far east as Fillmore, Utah. However, most of the samples taken did not include fresh fission products.

Since peak radioiodine concentration in milk can be expected 3 to 5 days following a contamination of feed, the 20 pc/l of I^{131} in milk from Donahue's Ranch on August 30 is assumed to be close to the maximum value that occurred at this location. This value can be compared to the Federal Radiation Council (FRC) Report No. 2[1]. A daily intake of 100 pc averaged over a year is considered an acceptable intake level. Such an intake will yield a 0.5 rad/year dose to an infant's thyroid. Thus the radioiodine level in milk at Donahue's Ranch did not represent a hazard.

[1] "Background material for the development of radiation protection standards," Report No. 2, Federal Radiation Council, Sept. 1961.

Section 2. KIWI B4E EPVI, SEPTEMBER 10, 1964

I. OPERATIONAL PROCEDURES

The KIWI B4E reactor was tested under the conditions known as Experimental Plan VI (EPVI) on September 10, 1964 with the reactor tested in an upright position. The test was a nominal two minute run at design power and commenced at 1155 PDT.

The procedures followed on this experiment were similar to those in support of the August 28 test.

II. RESULTS

The September 10 design power run yielded low levels of radioactivity off the test range complex. A summary of weather conditions at 1155 on the test day is presented in Table 6. Based on these conditions radiation monitors were positioned in an area north by northeast of the test range complex.

A. Ground Monitoring Data

Gamma dose rates above background were not detected off the test range complex with portable monitoring instruments, although monitors were in the path of the cloud as determined by aerial monitoring and environmental sampling.

B. Dose Rate Recorder Data

Recorder data, including that from Pioche, Caliente, and Alamo indicated no dose rates above background on the day of the test.

C. Film Badge Data

Due to the low dose rates off the test range complex, no off-site film badges were collected immediately following the KIWI B4E test. Badges collected since that time, however, have had no exposures which could be attributed to the EPVI test.

D. Air Sample Data

Three samples collected on the test day contained fresh fission products and the results are presented in Table 5. Other air samples taken on September 10 at Pioche, Alamo, Ely, Sunnyside, and Currant, Nevada, and Garrison, Utah did not contain detectable quantities of fresh fission products.

Table 5. Analyses of air samples containing fresh fission products collected following the KIWI B4E EPVI Experiment reported in pc/M^3 at end of collection.

Location	Time-Date on Hrs PDT	Time-Date off Hrs PDT	Volume (M^3)	Prefilter Gross Beta		Gamma Pulse Ht. Analysis I^{131}	I^{132}	I^{133}	I^{135}
Goss' Ranch	1500 9-10	1745 9-10	119	445	P	7.0	ND	3.0	28
					C	0.8	ND	3.0	ND
Hiko	0810 9-10	0815 9-11	900	19	P	0.3	ND	2.0	ND
					C	0.2	ND	0.5	ND
Caliente	0920 9-10	0800 9-11	963	<1	P	0.1	1.5	1.0	ND
					C	ND	ND	ND	ND

P-prefilter C-charcoal cartridge ND-not detectable

Table 6. Meteorological data for EPVI

Upper air data at: Jackass Flats, Nevada, 1230 PDT, 9/10/64.

Height (Ft. MSL)	Wind (Deg/Kts)	Pressure (mb)	Temperature (°C)	Dew Point (°C)	Relative Humidity (%)
SFC	185/12	894	29.0	1.5	17
4000	193/06	884	27.5	-1.5	15
5000	194/08	852	24.0	-3.4	16
6000	194/10	824	21.3	-2.6	20
7000	196/09	794	18.8	-2.8	23
8000	188/07	757	15.7	-2.7	28
9000	207/08	740	12.6	-4.1	31
10000	256/08	715	9.5	-5.7	34
11000	252/14	688	6.8	-6.9	37
12000	239/17	666	5.7	-10.9	29
13000	244/22	638	4.6	MB	(13)
14000	243/19	616	2.0	MB	(13)

MB-Motor Boating-dewpoint was below the limitation of the instrument.

E. Milk and Vegetation Data

Only milk samples from Schofield Dairy Farm at Hiko, Nevada indicated fresh fission products in detectable quantities. Results of analysis of all milk samples collected are shown in Table 7. Vegetation samples were collected primarily to determine milk sampling locations.

Table 7. Milk and vegetation analyses for EPVI

COLLECTION DATA		Radioassay Data			Vegetation Samples Taken
LOCATION	DATE COLLECTED	ACTIVITY (pc/l)			
		I^{131}	I^{133}	Cs^{137}	
	1964				
Schofield Dairy	9-12	30	<20	40	P
Hiko, Nevada	9-13	40	<20	35	P
	9-15	<20	<20	<20	P
	9-17	<20	<20	<20	P
	9-23	<20	<20	<20	P
Stewart	9-11	<20	<20	35	ND
Alamo, Nevada	9-12	<20	<20	30	ND
	9-13	<20	<20	35	ND
	9-15	<20	<20	85	ND
Horlacher	9-11	<20	<20	70	ND
Pioche, Nevada	9-12	<20	<20	70	ND
	9-13	<20	<20	55	ND
Young	9-11	<20	<20	10	ND
Caliente, Nevada	9-12	<20	<20	20	ND
	9-13	<20	<20	20	ND
Lytle	9-12	<20	<20	30	ND
Ursine, Nevada	9-13	<20	<20	15	ND

Notes: P-presence of fresh fission products in vegetation sample
ND-fresh fission products not present in vegetation

III. CONCLUSIONS

The KIWI B4E EPVI test yielded low levels of radioactivity off the test range complex. Although EPV is believed to have produced a greater release of fission products than EPVI, the peak concentrations of 40 pc/l of I^{131} in milk at Hiko following EPVI was greater than values in any milk collected following EPV. This was undoubtedly due to meteorological conditions on the test days.

Schofield Dairy Farm at Hiko, Nevada, was the only location that showed radioiodine in milk samples. There are no other dairies in Hiko. As stated earlier in the report, a daily intake of 100 pc/l averaged over a year is considered an acceptable intake level. Therefore, the maximum concentration of 40 pc/l at Hiko presents no radiological hazard to the consumers of the milk.

Winds on August 28 for EPV were very strong and gusty while those on September 10 for EPVI were light. The strong winds of August 28 spread the fresh fission products rapidly over a large area, reducing the concentrations in any one area. Wind conditions on September 10 carried the effluent to the Hiko area in approximately 10 hours for an arrival time of 2200 PDT. Negligible winds during the night tended to concentrate the deposition in the Hiko area. Such reasoning constitutes a possible explanation for the lack of detectable contamination at locations other than at Hiko.